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A RECORD OF PONDEROSA PINE SEED FLIGHT

by

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When natural seedfall is needed to restock denuded forest areas, effective seeding distance becomes very important.

This note reports on 1958 dissemination of ponderosa pine seed into a 65-acre tract, bare of overstory, in central Oregon.

PAST WORK

Published information on ponderosa pine seed dispersal into large openings is scarce because most managed stands have been selectively cut and distant seed flight was of minor concern. Earlier workers *(1, 7, 3)* agree that most seed falls within 2 chains[1] of its source. However, theoretical calculations of ponderosa pine seed flight, based on Siggins' *(6)* work, indicate that seed from a 100-foot tree could, with a 20-mile-an-hour wind, be disseminated up to a distance of about 9 chains. Fowells and Schubert *(3)* point out that theoretical flight distances do not account for factors such as wind gusts, updrafts, and air turbulence. Working in California, these investigators estimated that little seed is dispersed more than about 4.5 chains. Isaac *(5)*, studying the dissemination of winged ponderosa pine seed from a pilot balloon at an elevation of 150 feet in a 3.5-mile-an-hour wind, found the greatest concentration of seed at a distance of 4.5 chains from the point of release. At 7.6 chains, 12.5 percent of the seed was recovered. No seed was found at 9.1 chains.

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[1] The "chain" used as a unit of measure in the text is 66 feet long and composed of 100 subdivisions or links 7.92 inches long. The study was established using a 2-chain surveyors' tape supplemented by correction graduations for use in slope chaining with the topographic Abney level.

Workers *(7, p. 7)* in Idaho found that 82 percent of ponderosa pine seed falling within 7.6 chains of the timber edge was confined to an area only 1.5 chains from the source. Curtis and Foiles *(1)*, also in Idaho, studied dissemination of ponderosa pine seed into scarified 0.25- to 3-acre clearcuttings. Two or more overstory trees were left on the margin of the area to provide seed and shade for the seedlings. They concluded that "...most of the seed from a tree falls within a chain of it...."

EXPERIMENTAL AREA

The 1958 central Oregon study was made on the Pringle Falls Experimental Forest within a 65-acre oval-shaped tract where the overstory trees had been completely removed. This cutting area provided a good opportunity to study natural seed flight over greater distances than previously reported. The area is on a gentle east-facing slope at an elevation of about 4,400 feet and 600 feet below the summit of Pringle Butte. Prevailing winds, in autumn, at time of greatest seedfall, are from the southwest.

The timber stand surrounding the study area averaged 20,000 board feet per acre and consisted of overmature and mature ponderosa pine trees averaging 110 feet high.

STUDY METHODS

Seed dispersal was sampled on both eastern and western edges of the 65-acre study area. Two parallel seedtrap lines, 2 chains apart, extended 8 chains from the eastern timbered edge toward the middle of the cleared area (fig. 1). Two additional trap lines extended completely across a narrower portion of the cleared area. In both cases, seedtraps were placed at the timbered edge and at 2-chain intervals out into the cleared area.

Twenty-six traps of two sizes were used. Eight traps had horizontal surface dimensions of 4 feet by 4 feet and were placed at locations 6 and 8 chains from timbered edge. The other 18 traps were smaller, 2 feet by 3 feet, and were located at distances less than 6 chains from the timbered edge. Seedtraps were in place by June 1, 1958, and were inspected for seed on October 10 and November 6, 1958, and again on May 11, 1959.

A few cones occurred on the ponderosa pine saplings within the cleared area. These cones were removed prior to seedfall to avoid confounding seed catches from the mature trees at the timbered edge.

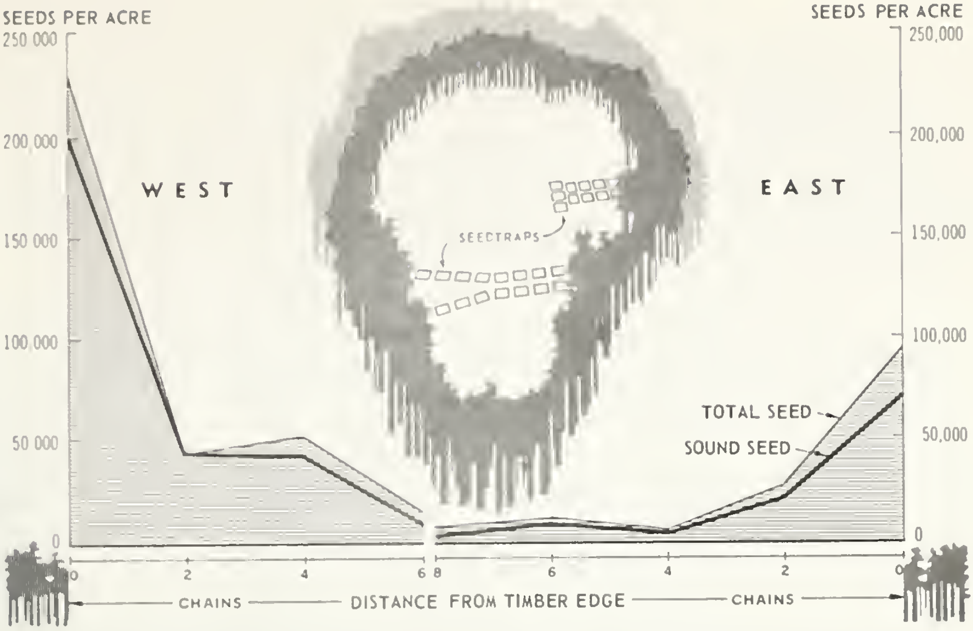

Figure 1.--Dissemination of ponderosa pine seed into area from east and west edges during 1958.

RESULTS

A good crop of ponderosa pine seed was produced in 1958 on the experimental forest. Prevailing westerly winds accounted for heaviest seedfall on the west edge of the cleared area where seed catches averaged almost 200,000 seeds per acre (fig. 1).[2] Quantity of seed dropped sharply with distance from source--43,500 seed per acre at 2 chains, and 15,000 at 6 chains. Seed catch at the eastern edge averaged 71,000 seeds per acre, diminished to 23,000 at 2 chains and only 5,400 at 8 chains from the edge.[3]

A cutting test revealed that 86 percent of the total seed collected at 2 chains from the timber edge was sound. Seed soundness at 8 chains decreased to 67 percent.

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[2] All seedfall statistics in text are sound seed only.

[3] Average of four trap lines originating on the eastern edge.

CONCLUSIONS AND DISCUSSION

The most apparent conclusion is that ponderosa pine seed does not disseminate naturally over extensive distances. For conditions in the vicinity of the study area, it seems logical that clearcuts should be small patches or narrow strips less than 5 chains wide at right angles to the prevailing winds if abundant natural regeneration is desired. Elsewhere, size of clearcut may vary depending on amount of summer rain, slope, and other environmental factors *(8)*.

On the other hand, site preparation may greatly increase effective seed disseminating distance by increasing the seed-to-seedling ratio. For example, Hallin *(4)*, working in California, observed a ratio of seed (130,000) to 4-year-old seedlings of 100 to 1, where rodents were poisoned and scarification kept competing vegetation "light." These practices resulted in an adequately stocked stand. However, attempts to duplicate these results several years later with a seedfall of about 45,000 seed per acre were only "moderately successful."

Exceptionally good seed-to-seedling ratios in group clearcuttings in central Idaho were attributed by Foiles and Curtis *(2)* to a comparatively cool, moist summer. However, they state, "...it would have been impossible to anticipate the combination of events that culminated in the unusually abundant seedling establishment...." Thus, there is an element of luck associated with good seed-to-seedling ratios in having sites prepared when seed production and environmental factors are ideal.

The seed flight information resulting from the Pringle Falls study is directly applicable to ponderosa pine in central Oregon. This knowledge may also be helpful elsewhere in determining how natural seedfall can be used in combination with other cultural measures to obtain prompt restocking of ponderosa pine.

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